RUST GEOTECH INC.

Spectral Gamma-Ray Borehole
Log Data Report

Borehole 52-04-06

Log Event A

Borehole Information

Farm : TY	**Tank :** TY-104	**Site Number :** 299-W10-98
N-Coord : 42,452	**W-Coord :** 75,954	**TOC Elevation :** 670.21
Water Level, ft :	**Date Drilled :** 12/31/1971	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:

This borehole was drilled in December 1971 to a depth of 100 ft. The borehole was initially located 2 ft south of its present location but drilling was abandoned when the core barrel was severed at a depth of 11 ft.

Though not specified in the driller's notes, a 6-in. casing was apparently installed between the ground surface and the bottom of the borehole. The casing thickness is presumed to be 0.280 in., on the basis of published thickness for schedule-40, 6-in. steel tubing. There is no indication of the use of a starter casing, that the casing was perforated, or that grout was installed in any interval of the borehole.

The top of the casing is the starting depth for the logs. The casing lip is contained within a concrete collar and is about even with the ground surface.

Equipment Information

Logging System : 1	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 04/1996	**Calibration Reference :** GJPO-HAN-5	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number :	1	**Log Run Date :**	5/6/1996	**Logging Engineer:**	Mike Widdop
Start Depth, ft.:	98.5	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	36.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	5/7/1996	**Logging Engineer:**	Mike Widdop
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	37.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	3	**Log Run Date :**	5/7/1996	**Logging Engineer:**	Mike Widdop
Start Depth, ft.:	62.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	77.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Analysis Information

Analyst : H.D. Mac Lean

Data Processing Reference : P-GJPO-1787 Analysis Date : 2/6/1997

Analysis Notes :

This borehole was logged in three logging runs. The borehole log was completed in two runs. An interval of the borehole log was repeated as an additional quality check to assure the repeatability of the radionuclide assays.

The field verification spectra acquired before the two logging runs failed to meet the acceptance criteria established for the peak shape and system efficiency. A nonconformance report issued in August 1996 (N-96-05) identified the cause of this failure as a power supply malfunction that resulted in a low detector bias voltage being supplied to the logging tool. This malfunction occurred in the mornings during start-up of the cold system but ceased after an abnormally long system warm-up time. This extra long warm-up time was required to bring the system to its optimal operating condition. The nonconformance report also documents that radionuclide concentrations calculated from data collected in the first 2 hours of logging could be systematically understated by about 10 percent. Data acquired during the early part of logging run two (ground surface to 30 ft) may show a slight discrepancy in repeatability if the borehole is re-logged in the future.

The post-survey field verification spectra for all logging runs passed the acceptance criteria for the peak shape and system efficiency, indicating that the logging system was operating within specification after an extended warm-up period. The energy calibration and peak-shape calibration from the post-survey field verification spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during logging. The system gain remained stable during the logging operation; it was not necessary to adjust the energy calibration for drift to maintain proper peak identification.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

A depth overlap, where radionuclide assays were calculated using separate data sets at overlapping depths, occurred between 36 and 37 ft. The calculated concentrations of the naturally occurring radionuclides were within two standard deviations of the measurements (the two-sigma or 95-percent confidence interval), indicating that the measurements of the gamma-ray spectral peak intensities used to calculate the radionuclide concentrations were repeatable within acceptable limits. In addition, the interval of the log between depths of 62 and 77 ft was repeated as part of a system quality check. Most of the calculated naturally occurring radionuclide concentrations were within two standard deviations of the measurements (two-sigma or 95-percent confidence interval), indicating acceptable repeatability of the measurements of the gamma-ray energies used to calculate the radionuclide assays.

The only man-made radionuclide detected in this borehole was Cs-137. The contaminant was detected continuously from the ground surface to a depth of 12 ft and at the bottom of the borehole. The maximum Cs-

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37 concentration was 0.79 pCi/g at 1.5 ft.

The K-40 concentration values increase from a background of about 12 pCi/g above 46 ft to about 18 pCi/g below this depth. The measured Th-232 and U-238 concentrations increase perceptibly below a depth of about 92 ft.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks TY-104 and TY-106.

Log Plot Notes:

Separate log plots show the concentrations of the man-made (Cs-137) and the naturally occurring radionuclides (KUT). The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

A combination plot includes the man-made and natural radionuclides, in addition to the total gamma derived from the spectral data and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A separate plot shows the calculated concentrations of the naturally occurring radionuclides within the repeated log interval. The radionuclide assays were calculated using the separate data sets provided by the original and repeated logging runs.